COGNITIVE-LINGUISTIC ABILITIES IN BILINGUAL CHILDREN

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Abstract

There has been much debate among researchers and educators on the effects of bilingualism on the young children. Literature hints that bilingual children have a cognitive advantage. However, studies to explore the effect of bilingualism on cognitive and linguistic abilities are limited. The main aim of the present study was to evaluate the performance of bilingual children on cognitive-linguistic tasks. The participants in the study included 12 bilingual children and 12 monolingual children in the age range of 7-8 years. The Cognitive Linguistic Assessment Protocol for Children (CLAP-C) (Anuroopa & Shyamala, 2008) for children was administered on the selected participants. The CLAP-C assesses the performance of the children in three domains i.e. attention/ discrimination, memory and problem solving. The analyzed data was tabulated for each subject and subjected to appropriate statistical analysis. The results revealed that bilingual children were superior to monolingual children on all the cognitive- linguistic tasks, assessed in CLAP-C (attention/discrimination, memory and problem solving). Both the groups scored maximum in attention domain, followed by problem solving and then memory. The results of the present study revealed that bilingual children had a clear cognitive-linguistic advantage compared to monolingual children. The results firmly supported the claim that the bilingualism fosters the development of cognitive-linguistic functions in young children. Generalizing these results to the clinical population it is implicated that even children with communication disorders can be taught two or more languages, provided they have the potential to learn the languages.

Key Words: CLAP-C, dominant bilinguals, cognitive-linguistic advantage.

Communication is the most significant characteristic of human being throughout the entire span of life. Speech and language, the two important components of human communication involves learning and using a code, retrieving a linguistic unit, organizing and further processing; all of which requires cognitive abilities. Thus communication results from the interaction of cognition and language and the cognitive processes shape the use of language skills for communicative functions. Cognition involves a wide range of mental processes such as attention, pattern recognition, memory, organization of knowledge, language, reasoning, problem solving, classification, concept and categorization (Best, 1999). These cognitive processes are interrelated with one another rather than existing in isolation. According to Choi (1997) there is a close interaction between children's cognitive capacity and the influence of language specific input from the very beginning of linguistic development.

Cognition is affected by the process of learning one or more languages. Children who have the ability to communicate in two languages viz. the bilingual children are different from monolinguals in

Various ways. The differences are evident in the way they acquire language, their experiences in school, and their socialization with their peers. The linguistic experience is spread over two languages, experience is encoded in either of the two languages and can be expressed in both languages and information representation can be switched between the languages. Researchers have studied the effects of bilingualism on cognitive and linguistic abilities; they have focused on how a child with more than one language mentally organizes language and on the repercussion of bilingualism on cognitive and linguistic development.

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Some of the earliest empirical work related to bilingualism reported the detrimental effects of bilingualism on cognition and language. Saer (1923) concluded that bilinguals are mentally confused and are at a disadvantage in thinking compared to monolinguals. Bilinguals consistently scored lower on verbal intelligence (IQ) tests and are disadvantaged on performance tests as well (Darcy, 1963). Further an overwhelming majority of studies found strong evidence for the so-called 'language handicap in bilingual children (Arsenian, 1937;

Darcy, 1953, 1963; Jensen, 1962; Macnamara, 1966). When compared to monolinguals, the bilingual children appeared inferior on a wide range of linguistic abilities. Among other things, bilinguals were shown to have a poorer vocabulary (Saer, 1923; Grabo, 1931; Barke & Perry-Williams, 1938; Smith, 1949; Ben-Zeev, 1977; Doyle, Champagne & Segalowitz, 1978), deficient articulation (Carrow, 1957), lower standards in written composition and more grammatical errors (Saer, 1923; Harris, 1948). The reason proposed for the poorer vocabulary was that the bilingual children had to learn two different labels for everything, which reduced the frequency of a particular word in either language (Ben-Zeev, 1977). This made the task of acquiring, sorting, and differentiating vocabulary and meaning in two languages much more difficult when compared to the monolingual child's task in one language (Doyle et al., 1978). Further, Gollan, Montoya and Werner (2002) suggested that the semantic fluency of monolinguals is higher than bilingual, i.e., the bilingual needs to ensure that the correct word is chosen from their two languages and they are more likely to report a 'tip of the tongue state' possibly because they use some words in both the languages less often (Gollan & Acenas, 2004).

Some studies found no differences between monolingual and the bilingual group in cognitive and linguistic tasks (Rosenblum & Pinker, 1983). According to Toukomaa and Skutnabb-Kangas (1977) children with native competency in one language only, normally their mother tongue but with a much less command of the other language, showed neither positive nor negative cognitive effects i.e. their performance did not differ from that of monolingual children.

On the contrary, there are a few other studies that support the view that speaking two languages does not tax either the cognitive or the linguistic system; rather bilingualism confers advantages upon children with respect to various cognitive and linguistic abilities (Ben-Zeev, 1977; Francis, 1990a; Diaz & Klinger, 1991; Hoffman,

1991; De Groot & Kroll, 1997). Ben-Zeev (1977) studied Hebrew-English and Spanish-English bilingual children and concluded that bilinguals process the semantic information more deeply than the monolinguals and showed greater cognitive flexibility and was capable of more complex analytical strategies in their approach to language operations. These findings are consistent with the views of Vygotsky (1962) who argued that being able to express the same thought in different languages will enable the children to see the language as one particular system among many, to view it's phenomena under more general categories, and this leads to awareness of the linguistic operations. Bilingual children have accelerated metalinguistic awareness compared to monolingual children (Cummins, 1978; Mohanty, 1982; Galambos & Goldin-Meadow, 1990; Bialystok, 1991). They also excel at paying selective attention to relatively subtle aspects of language tasks, ignoring more obvious linguistic characteristics (Bialystok, 1992; Bialystok & Majumdar, 1998; Cromdal, 1999). Campell and Sias (1995) reported that bilinguals performed at higher level than monolinguals on the phonological tasks.

Kessler and Quinn (1987) found that the bilingual children outperformed the monolinguals in the ability to formulate scientific hypothesis in a problem-solving setting and on semantic and syntactic measures. This was perceived to be an indication of enhanced linguistic and cognitive creativity directly related to their bilingual language proficiency. Findings of Kormi-Nouri, Moniri and Nilsson (2003) suggested that bilingual children integrate and/or organize the information of two languages, and therefore bilingualism creates advantages in terms of cognitive abilities (including memory). It extends the individual's capabilities and promotes mental processing (i.e. problem solving, thinking, flexibility and creativity).

A similar study was carried out in the Indian context by Rajasudhakar and Shyamala (2008) in bilingual adults and elderly. They studied two groups of subjects consisting of forty young and old individuals. Each group had 20 monolinguals and 20 bilinguals. Cognitive Linguistic Assessment Protocol

(CLAP) for adults developed by Kamath and Prema (2003) in Kannada was used for assessing the cognitive-linguistic abilities of young as well as older monolinguals and bilinguals. The results indicated that bilingual adults and elderly performed better on all the domains of CLAP indicating a cognitive-linguistic advantage.

Need for the study

In summary, the findings from the literature revealed mixed evidence of the effects of bilingualism on cognition and language in young children. This inconsistency could partly be because of the wide variations in the proficiency in the second language in children, the aspects of cognition and language studied, the methodological differences etc. Since the findings from different studies are contradictory, further evidence is essential to corroborate these results. Further, as the chances of exposure to other languages and culture is becoming a common phenomenon with the advanced life styles and life circumstances, especially in a fast developing country like India, there is a need to further investigate in detail whether bilingualism creates positive or negative impacts in the overall development and functioning of an individual. Hence, it is important to establish the precise effects of bilingualism on cognitive-linguistic processing. However, in the Indian context such studies to explore the relationship between bilingualism and cognitive-linguistic performance especially in young children are limited. Thus this investigation was undertaken to examine whether introducing two languages right from the preschool period would facilitate or hamper the child's cognitive-linguistic abilities.

Aim of the study

The main aim of the present study was to investigate the performance of the bilingual children on cognitive-linguistic tasks and to explore the presence of bilingual advantage, if any.

Method

Participants: Two groups of typically developing children ranging in age from 7 to 8 years who were native speakers of Kannada participated in the study.

Group 1: Comprised of twelve (6 males and 6 females) Kannada speaking monolingual children.

Group 2: Comprised of twelve (6 males and 6 females) Kannada- English speaking dominant bilingual children who were more proficient in Kannada.

The participants were selected from schools in the city of Mysore and Chamarajanagar (Karnataka state). The children included in the Group 1 were studying in Kannada medium schools with English as the second language from grade I. These children had limited exposure to English while the children included in the Group 2 were studying in English medium schools and had greater exposure to English since the entire curricula was taught in English language. All ethical standards were met for subject selection and their participation.

Participant selection criteria:

The criteria considered for the selection of monolingual and bilingual subjects were:

1. No history of language, hearing, neurological, developmental, academic and intellectual disorders, which was ensured using the 'WHO Ten-question disability screening checklist' (Singhi, Kumar, Malhi & Kumar, 2007).
2. Participants belonging to lower and middle socioeconomic status with one of the parent employed and monthly income not exceeding Rs.15,000.
3. A rating of 'minimal social proficiency' (a score of 2) in their second language to be considered as a bilingual and a rating of 'initial proficiency' (a score of 0+) on all the macro skills of the International Second Language Proficiency Rating scale (ISLPR) (Ingram, 1985) to be considered as a monolingual. ISLPR describes language performance at eight points along the continuum from zero to native like proficiency in each of the four macro skills (speaking, listening, reading and writing). However, only few aspects relevant for the children were utilized from the scale. The teachers handling the children were also consulted while rating these children for their language proficiency.

Procedure:

The Cognitive Linguistic Assessment Protocol for children (CLAP-C) developed by Anuroopa and Shyamala (2008) was administered on the selected participants. This is a test developed to assess the cognitive-linguistic abilities of Kannada speaking children in the age group of 4-8 years. CLAP-C consists of three domains viz. attention / discrimination, memory and problem solving and each domain consists of three auditory and three visual

subtasks. A total of 5 or 10 levels are included in each subtask and these are arranged in a hypothetical order from simple to complex.

The participants were seated comfortably and were tested in a room with minimum external noise and distractions. Instructions specific to the task were given in Kannada. The testing was carried out in one session which lasted for approximately 45 minutes and was done in both the auditory and visual sensory modalities. The tasks were scored as per the scoring procedure provided in the test for each item. Every correct response was given a score of '1' and every wrong response was given a score of '0'. Subsequently, the total score for each of the domain was tabulated and the data obtained was subjected to appropriate statistical analysis.

I. Effect of group and gender within each domain

II. Comparison of domains within each group

III. Comparison between groups within the three subtasks in each domain

I. Effect of group and gender within each domain

The performance of the monolingual and bilingual children was compared across the three domains of CLAP-C viz. attention/discrimination, memory and problem solving. The mean and the standard deviation (SD) of both the groups are depicted in Table 1. A comparison of the mean scores of both the groups in each of the three domains revealed that the bilingual children performed better than the monolingual children. The same has been depicted in Figure 1.

Table 1: *Mean and SD (Standard Deviation) of CLAP-Cdomains for monolingual and bilingual children.*

Group	Gender		Domain		
			Attention/ discrimination	Memory	Problem solving
Monolingual children	Male	Mean	35.33	13.00	23.16
		SD	3.14	2.36	2.63
	Female	Mean	35.50	12.50	23.66
		SD	2.42	3.14	2.94
	Total	Mean	35.41	12.75	23.41
		SD	2.67	2.66	2.67
Bilingual children	Male	Mean	37.66	18.83	35.16
		SD	1.21	3.65	2.63
	Female	Mean	37.00	17.33	34.50
		SD	1.54	0.51	4.50
	Total	Mean	37.33	18.08	34.83
		SD	1.37	2.60	3.53

Statistical analysis:

A commercially available SPSS package (version 16.0) was used for statistical analysis. The mean and the standard deviation were obtained for each of the domain in the two groups of children. Two-way MANOVA was used to compare the performance within the three major domains of CLAP-C across the two groups and gender. Repeated Measure ANOVA was done to compare the performance across domains within monolingual and bilingual group. Independent t-test was also used to compare performance of the groups within the subtask of each domain:

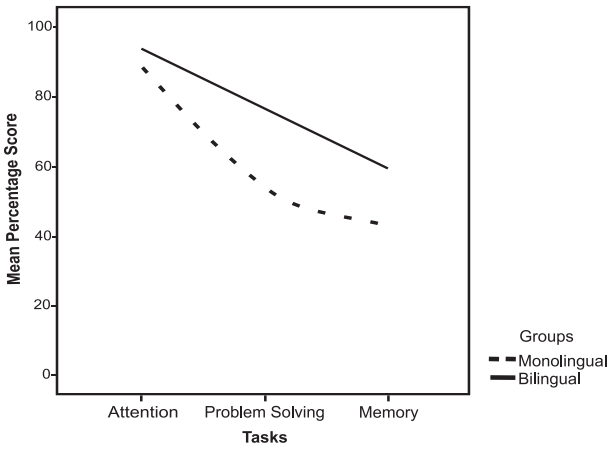

Figure 1: Performance of monolingual and bilingual children across CLAP-C domains

The mean scores obtained for the various domains were subjected to two-way MANOVA which revealed that there was a significant difference between the monolingual and the bilingual children in all the three domains. However, there was no effect of gender and no significant interaction between group and gender in any of the three domains. The results of the two-way MANOVA are depicted in Table 2.

Table 2: *F-values and significant level for the two groups, gender and the interaction between group and gender*

	Domain	F-values (1, 20)	Significant level
Groups	Attention	4.49	0.05*
	Memory	23.43	0.00**
	Problem solving	72.92	0.00**
Gender	Attention	0.08	0.79
	Memory	0.82	0.38
	Problem solving	0.00	0.95
Interaction between group and gender	Attention	0.21	0.65
	Memory	0.21	0.66
	Problem solving	0.19	0.67

*p<0.05, **P<0.01

These results are in agreement with the studies by Ben-Zeev, (1977); Kessler and Quin, (1987); Diaz and Klinger, (1991); Hoffman, (1991); Bialystok, (1992); De Groot and Kroll, (1997); Bialystok and Majumdar, (1998); Cromdal, (1999); Francis, (1990a); Bialystok, (2001); Korimi-Nouri, Moniri and Nilsson, (2003) who found that bilingualism creates advantages in cognitive and linguistic abilities. However, the results are in contrast to the studies by Saer, (1923); Arsenian, (1937); Darcy, (1953, 1963); Jensen, (1962); Macnamara, (1966); Toukomaa and Skutnabb-Kangas, (1977); Rosenblum and Pinker, (1983) which revealed negative effects of bilingualism or no differences between the two groups. However Lambert (1977) pointed out serious methodological flaws in these earlier studies such as the following: the bilingual and the monolingual groups were not controlled for differences in socio-economic status, education, degree of bilingualism and monolingualism and they used an inadequate criteria for selecting the bilingual children. However, the recent studies do support the fact that bilingualism is associated with some advantages in using cognitive and linguistic processes. This is because the bilingual children integrate and/or organize the information of two languages. One possible reason for the bilingual advantage is that bilingual children must learn to reduce the interferences between their two languages in order to speak only one. Another possibility is that bilingualism trains children to focus their attention on the relevant variables in the context, particularly information that is ambiguous or contradictory (Bialystok, 1991).

II. Comparison of domains within each group

Repeated measure ANOVA was administered to examine whether any differences existed within the monolingual and the bilingual group across the three domains. The results revealed that there was a significant difference in the monolingual group [$F(2,22)=237.39$, $p<0.01$] and the bilingual group [$F(2,22)=106.35$, $p<0.01$] across the domains. Further, within the domains the monolingual and bilingual children attained maximum scores in attention/discrimination followed by problem solving and memory domain (Table 1). This could be attributed to the fact that the bilingual children are constantly involved in focusing their attention to reduce the interference between their languages ensuring that the right words are chosen while speaking. This results in an overall improvement in the attention processes. (Bialystok, 1992; Bialystok & Majumdar, 1998; Cromdal, 1999). These results further confirm the fact that attention/discrimination is one of the prerequisite cognitive-linguistic tasks which forms the foundation for the other cognitive domains such as memory and problem solving to develop.

III. Comparison between the groups within the three subtasks in each domain

1. Attention/discrimination:

The attention/discrimination domain consisted of two main subsections i.e. visual and auditory tasks. The auditory task consisted of three subtasks including digit count test (A-DCT), sound count test (A-SCT) and auditory word discrimination test (A-AWD). The visual task consisted of three subtasks including odd one out (V-OOT), letter cancellation (V-LC) and visual word discrimination test (V-VWD). The mean and the standard deviation scores and the t-values obtained for the two groups of children for each of the subtasks in the attention domain is depicted in Table 3. The mean scores for all the auditory and visual subtasks in the attention domain was higher for bilingual children compared to the monolingual children which indicated better performance by the bilingual children on the attention domain.

Table 3: *Mean, SD (Standard deviation) and t-values of performance on the subtasks in the attention domain across the groups*

Subtasks in the attention/discrimination domain		Groups				t-value df (22)
		Monolingual children		Bilingual children		
		Mean	S.D	Mean	S.D	
Auditory	Digit count test	73.33	21.46	90.00	15.95	**2.16***
	Sound count test	86.67	19.70	95.00	9.05	1.33
	Auditory word discrimination	89.17	7.93	95.00	6.74	1.94
Visual	Odd one out	95.00	9.05	96.67	7.79	0.48
	Letter cancellation	75.00	12.43	76.67	7.79	0.39
	Visual word discrimination	99.17	2.89	100.00	0.00	1.00

**p<0.05*

Although the bilingual children performed better on all the subtasks, the independent t-test revealed a significant difference existed only in the digit count test (an auditory subtask). The Figure 2 depicts the differences between two groups of children across the various subtasks.

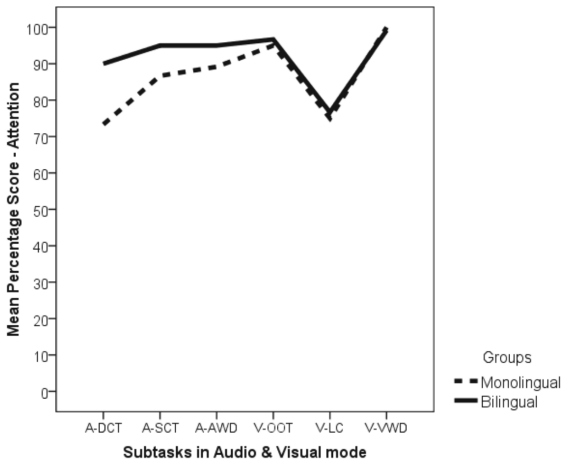

Fig 2: Performance on individual subtasks in the attention domain across groups

A-DCT - Auditory: digit count test, A-SCT - Auditory: sound count test, A-AWD - Auditory: auditory word discrimination, V-OOT - Visual: odd one out, V-LC - Visual: letter cancellation, V-VWD-Visual: visual word discrimination.

This indicates that both monolingual and bilingual children are comparable in their auditory and visual attention skills. Thus it can be inferred that attention is a basic prerequisite skill necessary for language acquisition and communication. However the bilingual children did show the advantage in attention as a result of the representation of two languages in their brain and the need to constantly focus on the right selection of the language and the other components of it depending on the context and the communication partner. These results are in consonance with the findings of several other studies by Bialystok, (1992); Bialystok and Majumdar, (1998) and Cromdal, (1999). Constant experience in attending to one of the languages and ignoring the other might enhance the ability of bilingual children to selectively attend to appropriate cues and inhibit attending to others (Bialystok & Martin, 2004). Bilingual children have better inhibitory control for ignoring perceptual information and selectively paying attention to appropriate information (Bialystok, 2001).

2. Memory

The memory sub-section of CLAP-C consists of two modes, i.e. auditory and visual. Auditory mode consists of three subtasks-digit forward (A-DF), word recall (A-WR) and digit backward (A-DB). Visual mode consists of three subtasks-alternate sequence (V-AS), picture sequencing (V-PS) and story sequencing (V-SS). The mean, standard deviation and the t-values obtained for the two groups of children for each of the subtasks in the memory domain is depicted in Table 4. The mean scores for all the auditory and visual subtasks in the memory domain was higher for bilingual children compared to the monolingual children which indicated better performance by the bilingual children on the memory domain.

Table 4: *Mean, SD (Standard deviation) and t-values of performance on the subtasks in the memory domain across the groups*

Subtasks in the memory domain		Groups				t-value df (22)
		Monolingual children		Bilingual children		
		Mean	S.D	Mean	S.D	
Auditory	Digit forward	40.00	12.06	46.67	9.85	1.48
	Word recall	40.00	12.06	48.33	13.37	1.60
	Digit backward	23.33	7.79	30.00	10.45	1.77
Visual	Alternate sequencing	60.00	28.28	98.33	5.77	**4.60****
	Picture counting	45.00	12.43	60.00	14.77	**2.69***
	Story sequencing	46.67	17.75	78.33	23.29	**3.75****

*p<0.05, **p<0.01

Although the bilingual children performed better on all the subtasks, the independent t-test revealed a significant difference existed in all visual subtasks (alternate sequencing, picture counting and story sequencing) between monolingual and bilingual children. This indicated that the bilingual children have a stronger visual memory than auditory memory. The Figure 3 depicts the differences between two groups of children across the various subtasks.

3. Problem solving

The problem solving domain consisted of tasks in auditory and visual mode. Auditory mode further comprises of sections on predicting the outcome (A-PO), predicting the cause (A-PrC) and compare & contrast (A-CC) tasks. In visual mode, the subtasks include overlapping test (V-OT), association tasks (V-AT), and mazes (V-MZ). The mean, standard deviation and the t-values obtained for the two groups of children for each of the subtasks in the problem solving domain is depicted in Table 5. The mean scores for all the auditory and visual subtasks in the problem solving domain was higher for bilingual children compared to the monolingual children which indicated better performance by the bilingual children on this domain.

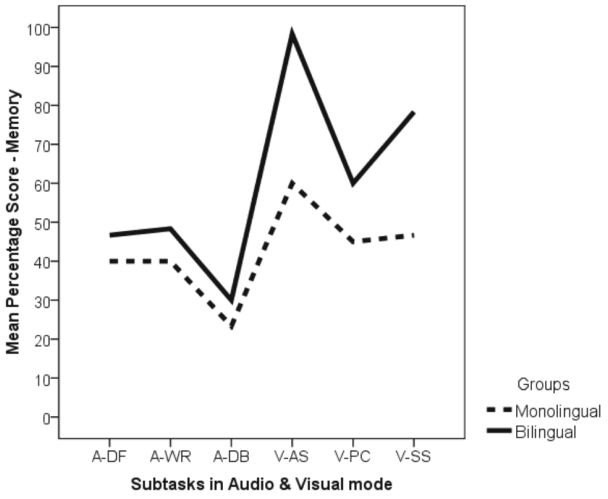

Figure 3: Performance on individual subtasks in the memory domain across groups

A-DF - Auditory: digit forward, A-WR - Auditory: word recall, A-DB - Auditory: digit backward, V-AS - Visual: alternate sequence, V-PS -Visual: picture sequencing, V-SS -Visual: story sequencing

These results are in consonance with the study by Feng, Bialystok and Diamond (2009) who showed a bilingual advantage in visual-spatial working memory but not on verbal-auditory working memory and the study by Kormi-Nouri, Moniri, and Nilsson, (2003) who found that bilingualism had positive effect on both episodic memory and semantic memory at all age levels.

Table 5: *Mean, SD (Standard deviation) and t-values of performance on the subtasks in the problem solving domain across the groups*

Subtasks in the problem solving domain		Groups				t-value df (22)
		Monolingual children		Bilingual children		
		Mean	S.D	Mean	S.D	
Auditory	Predicting the outcome	72.50	19.13	94.17	7.93	**3.63***
	Predicting the cause	54.17	16.77	78.33	14.67	**3.76***
	Compare and contrast	17.50	7.54	65.00	15.08	**9.76***
Visual	Association task	56.67	16.70	66.67	15.57	1.52
	Overlapping task	63.33	14.36	78.33	10.30	**2.94***
	Mazes	60.00	8.53	76.67	7.79	**5.00***

*p<0.01

Although the bilingual children performed better on all the subtasks, the independent t-test revealed a significant difference in all subtasks tasks except the visual association task. The Figure 4 depicts the differences between two groups of children across the various subtasks.

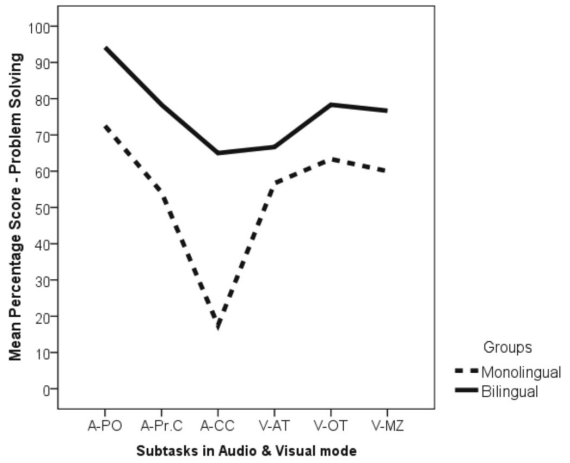

Figure 4: Performance on individual subtasks in the problem solving domain across groups

A-PO- Auditory: predicting the outcome, A-PrC-Auditory: predicting the cause, A-CC- Auditory: compare & contrast, V-OT- Visual: overlapping test, V-AT-Visual: association tasks, V-MZ-Visual: mazes

These results are well supported by studies done by Brain, (1975); Kessler and Quinn, (1987); Stephens, (1997) and Bialystok and Majumdar, (1998). Bilingual children between four and eight years demonstrated a large advantage over monolingual children in solving problems that required controlling attention to specific aspects of a display and inhibiting attention to misleading aspects that are salient but associated with an incorrect response (Bialystok, 1999). According to Carlson and Meltzoff, (2008) early exposure to more than one language may foster the inhibition and working memory skills necessary for cognitive flexibility in a variety of problem-solving situations.

Thus to summarize, the bilingual children performed better on all the cognitive-linguistic tasks included in the CLAP-C compared to the monolingual children. A significant difference was found between both the groups on the auditory digit count test of the attention domain, visual memory subtests and on the entire problem solving tasks except the visual association subtask. However, a significant difference was not found on the other subtasks. This could have resulted because of the subject sample considered for the study. The monolingual children were not pure monolinguals in that they did know a few words in the second language because of school exposure. However they were not as proficient as the bilingual children as stated previously. Moreover the bilinguals were dominant in their first language although they were quite proficient in their second language. This could have influenced the results of the study.

Conclusion

The current study was designed to evaluate the cognitive-linguistic performance in bilingual and monolingual children and to make a comparison between the two groups. A total of 12 bilingual children and 12 monolingual children in the age group of 7-8 years participated in the study. The important findings drawn from the present study are that the bilingual children performed superior to the monolingual children on cognitive-linguistic tasks including attention/ discrimination, memory and problem solving.

These results firmly support the claim that the bilingualism fosters the development of cognitive and

linguistic functions. The results of this study would enrich theoretical knowledge on the relations among bilingualism/monolingualism and cognition. In addition, it can be inferred from the results in the present scenario, it is worthwhile to teach two languages right from the preschool period which will enhance their cognitive-linguistic development rather than hampering. These results can be generalized to the clinical population and it can be inferred that even children with communication disorders can be taught two languages, if they have the potential to learn both the languages. But this has to be probed further with respect to the type of bilingualism preferred and supported with further research.

Since India is a multilingual country, there is a pressing need to carry out similar kind of research, in more number of languages and in multilingual children belonging to various cultural backgrounds to explore their cognitive and linguistic processes. In addition, further research is required considering a large sample of subjects, age groups, other cognitive domains (pattern recognition, reasoning, and orientation), different types of bilingualism (successive, co-ordinate, compound, passive, balanced) and in various speech and language disorders to discover the exact relationship between language and cognition. How much bilingualism is necessary, what type of bilingualism is required, and what particular language pairs maximize bilingual advantage are all questions that are still waiting to be answered.

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